ERIC Document Resume	See Instruction Sheet	DATE OF RESUME	DATE RECEIVED

A. PUBLICATION DATA

1. ERIC NUMBER	2. ORIGINATOR CONTROL NO(S).	3. IDENTIFICATION NO.	DO NOT WRITE IN SPACE BELOW
ED002405	N.A.	1900	

4. AUTHOR(S): Pella, Milton O. and others

5. TITLE OF DOCUMENT ABSTRACTED: Wisconsin Physics Film Evaluation Project

6. PUBLICATION TITLE: N.A.

7. EDITOR(S): N.A.

8. PLACE OF ORIGIN
ORG. University of Wisconsin
ST. Madison 6, Wisconsin
CITY, STATE
TELE. EXT.
INST/LOC CODE

9. PUBLISHER OR SOURCE
University of Wisconsin
Madison 6, Wisconsin

10. VOL.	11. PAGES	12. MO./YR.	13. TOTAL PP.
N.A.	N.A.	N.A.	32

MICROFILM COPY AVAILABLE YES ☒ NO ☐

COPYRIGHT GRANTED YES ☐ NO ☒

COPYRIGHT RELEASE FILED YES ☐ NO ☐

TYPE OF REPORT
PROPOSAL ☐
IN-PROGRESS ☐
FINAL ☒
FOLLOW-UP ☐

OTHER ERIC REFERENCES:

ERIC SATELLITE CODE

B. INDEXING DATA

14. SUBJECT AREA

15. TYPE OF ENDEAVOR: Report

16. INDEXING TERMS (6-12)
physics instruction
tele-films
student opinion
teacher opinion
audiovisual aids
secondary education

17. ABSTRACT (MAX. 250 WORDS) A program designed to develop and teach a high school physics course via television was presented. A faculty member of the University of California headed the program. The first one-year course was begun in September 1956, consisting of 162 daily half-hour lessons, telecast to 26 local classes.

During the telecasts, photography was accomplished with a motion picture camera arrangement. At the close of each day's television teaching, a complete 16mm sound motion picture record of the lesson was available, thus bringing the two media into interplay. The resulting films were labeled tele-films, or T-films.

Following the viewing of the first films, planning was initiated to evaluate the effectiveness of the materials as they might be used in high school physics study situations. Control and experimental groups were set up.

Physics teachers agreed that the films offered excellent laboratory demonstrations and experiments not possible in the ordinary high school laboratory, and that the content of the lessons was excellent. Many teachers disapproved of giving up almost all of their class time to the films, and others felt that a film a day did not provide enough variety of flexibility in the program.

Students felt that the demonstrations were excellent, but that the pace was too fast, the mathematics too advanced, and that they had no time in school for practice or experimental work.

Control students expressed a higher interest in science than the T-film students, and anticipated going to science class more. Intelligence had a positive influence on the students' interest in science. The higher the intelligence, the more interest in science was expressed. Graphs and charts were included.

ERIC No.

18. SOURCE OF ABSTRACT

C. FUNDING DATA

19. SUPPORTING ORGANIZATION

20. DIVISION OR DEPT.

21. CONTRACT NO.
PROJECT NO.

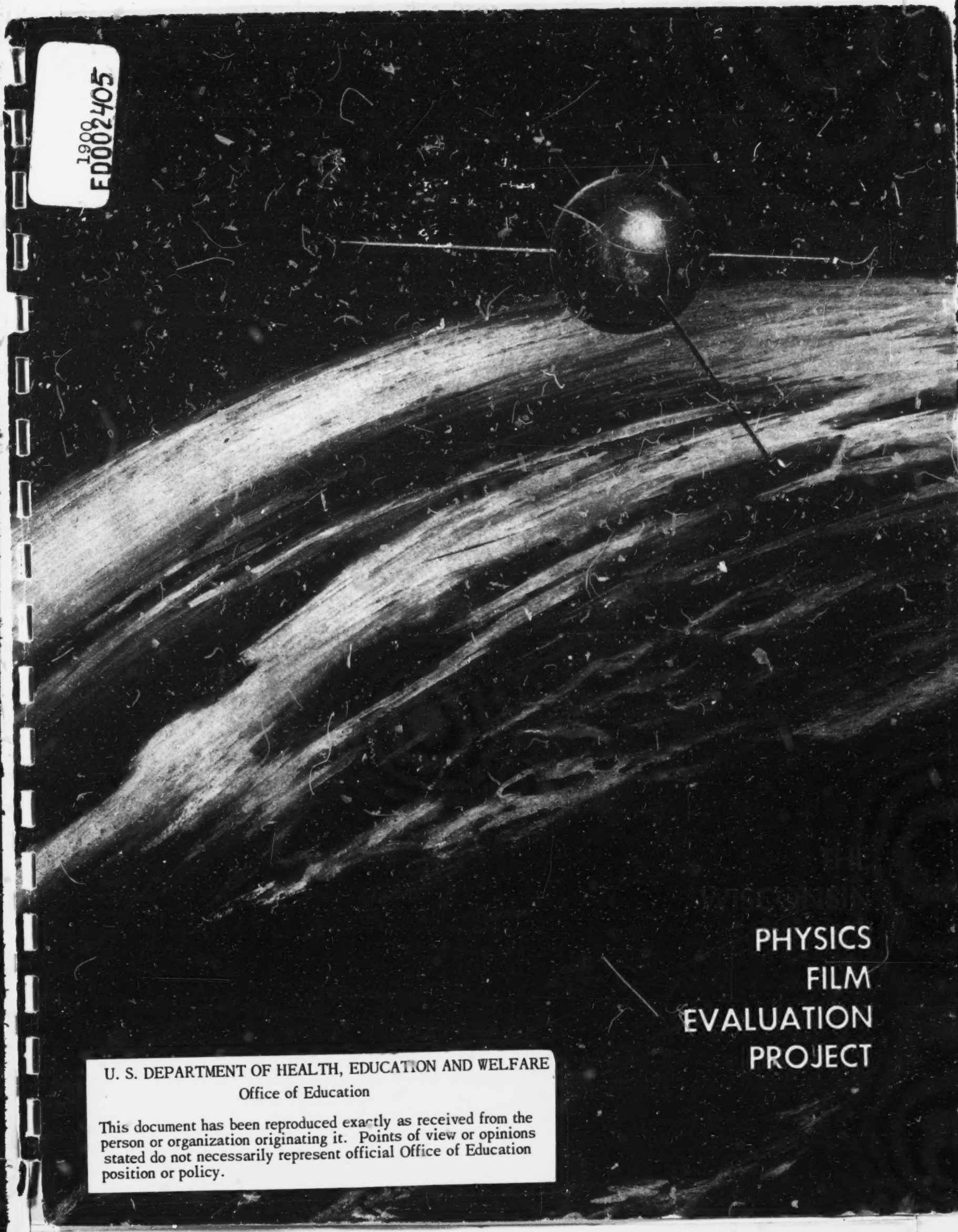
22. TOTAL COST OF PROJECT

23. DURATION OR PROJECT

U.S. Department of Health, Education, and Welfare
Office of Education

C Form 1

ED002405
1968



PHYSICS FILM EVALUATION PROJECT

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education

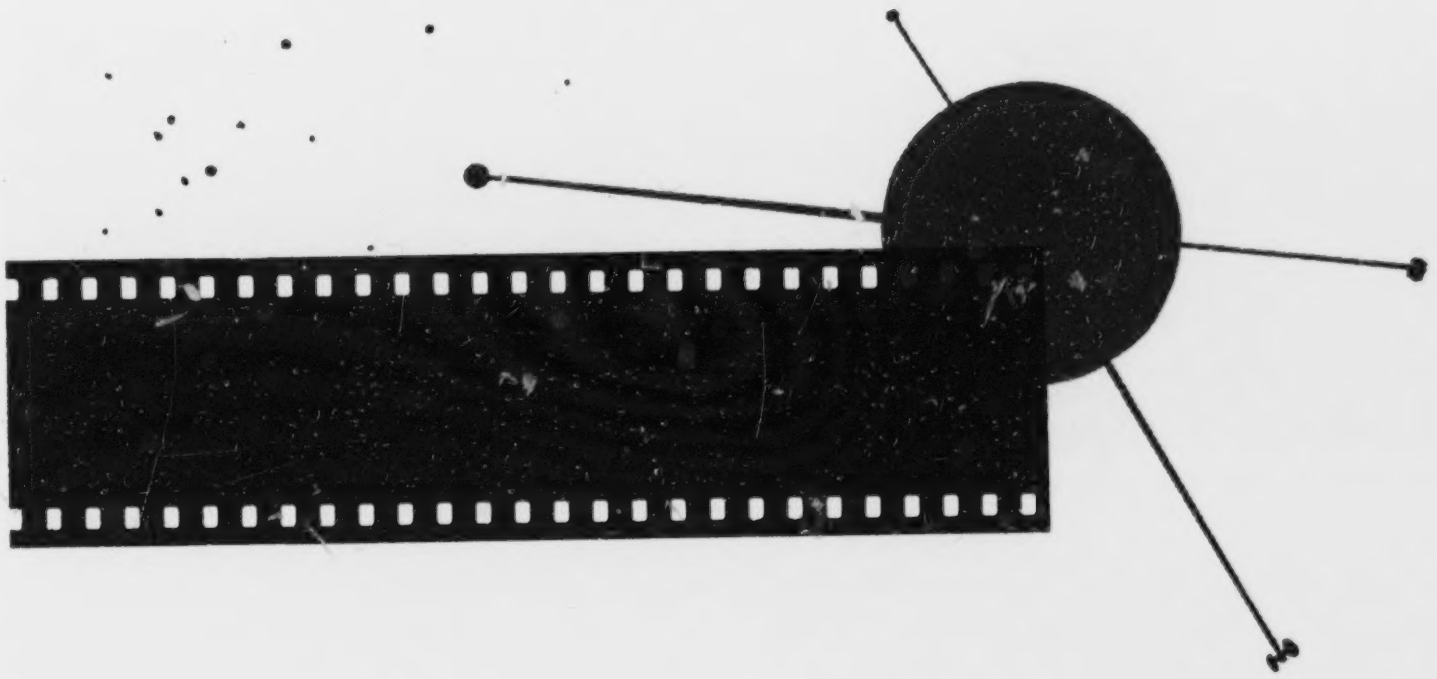
This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated do not necessarily represent official Office of Education position or policy.

INSTRUCTIONAL TECHNOLOGY - U.S.C.

James D. Ewin

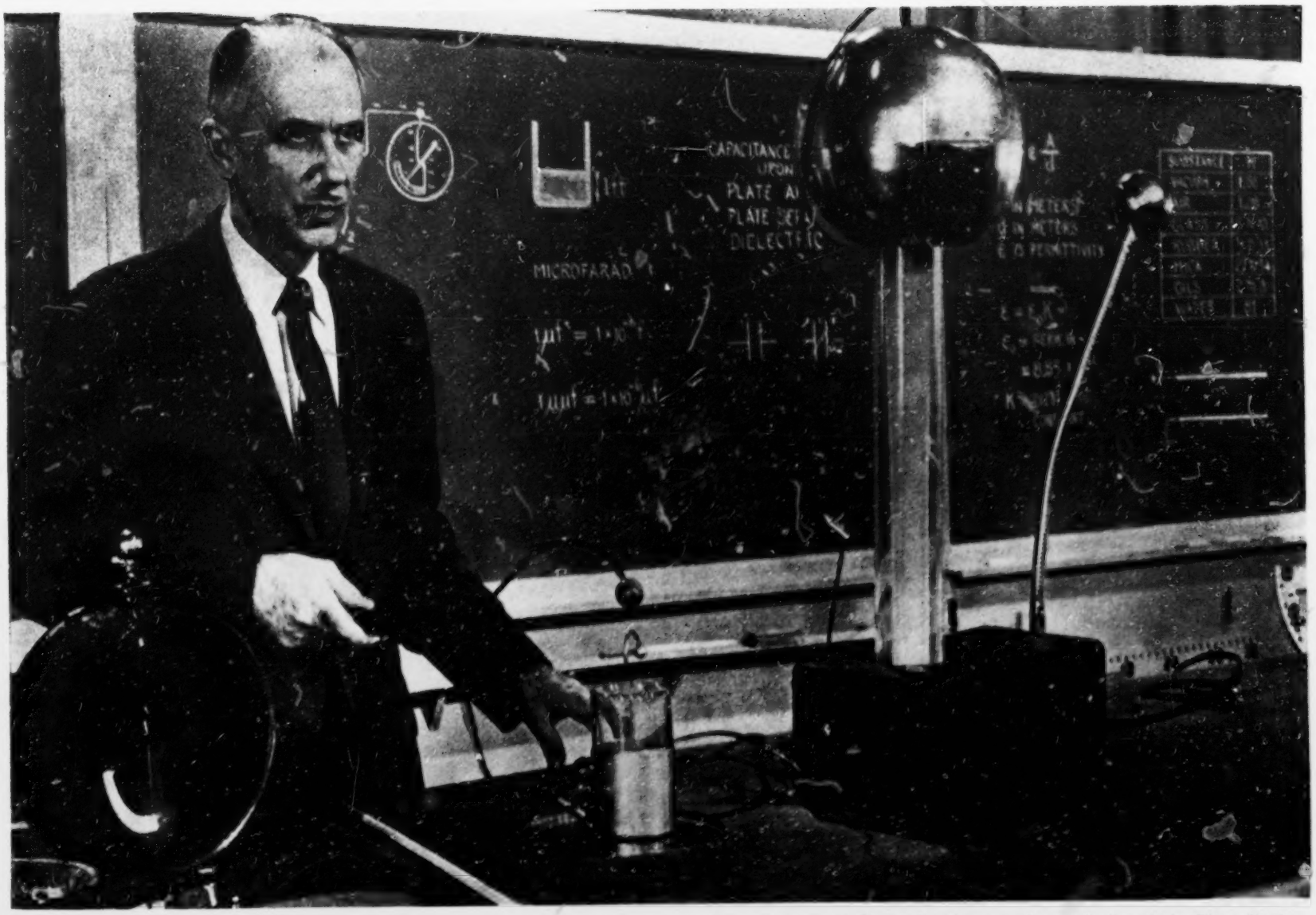
Personal Copy

THE WISCONSIN PHYSICS FILM EVALUATION PROJECT



J0232

ED002405



Dr. Harvey White, University of California at Berkeley, shown in his role as T-film physics teacher of the E.B. Film Series.

ACKNOWLEDGMENTS

The Wisconsin Physics Film Project is a cooperative undertaking. During the planning period, advice was sought from and reports made to the Wisconsin State Superintendent of Public Instruction, the Board of Wisconsin State College Presidents, the Wisconsin School Administrators Association, the dean of the University of Wisconsin School of Education, and the director of the University Extension Division. Helpful advice and counsel were received from Dr. Alvin C. Eurich of the Fund for the Advancement of Education and from Mr. Maurice B. Mitchell of Encyclopaedia Britannica Films, Inc.

As the project developed, the tasks of preparing teacher and pupil guides, and of nominating test items to be used in the evaluation instruments were undertaken and accomplished by members of the physics departments of Wisconsin State Colleges. These included Profs. Monica Bainter, Stevens Point; W. P. Clark, Eau Claire; Carlin Dahler, La Crosse; Earl King, Platteville; Lloyd Liedtke, Whitewater; Robert T. MacDonald, Oshkosh; V. B. Rasmusen, La Crosse; Orville Rice, Stevens Point; Edwin Schrieber, Superior; Richard Swenson, River Falls; Robert Uber, La Crosse; and Anthony Womanski, Oshkosh. The duplicating of their work was supervised by Mr. Kenneth G. Johnson, University of Wisconsin.

The task of developing Correspondence Study materials used in a later section of the study, was effectively handled by Richard Haney, Robert Showers, and Harry Wolf. The grading of Correspondence materials was similarly handled by Calvin Gale and John Kins. Student supervision of Correspondence Study materials was handled by Marvin English and Fred Mundt.

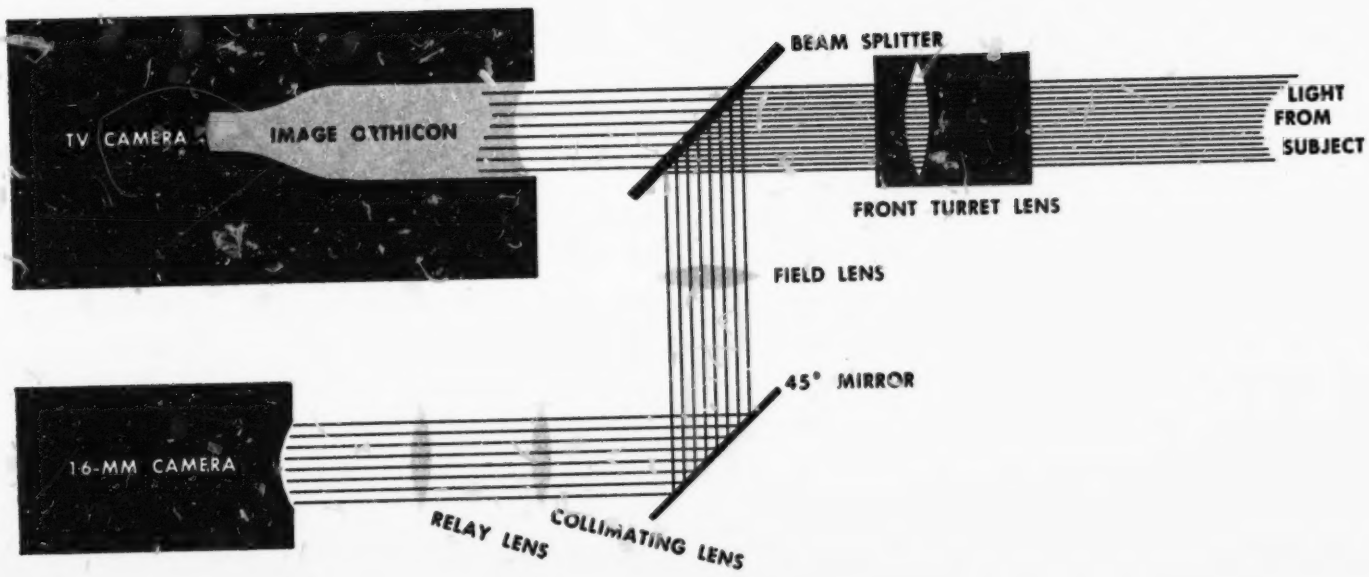
The day-to-day work of disseminating materials, completing schedules for testing, and processing evaluation data was handled by the graduate student research staff, including James Busch, Craig Eben, Leonard Garside, Fred Mundt, James Price, and their student supervisor, Donald Scott.

Scheduling and distribution of the physics films among the participating schools was supervised by Prof. F. A. White, University of Wisconsin. Invaluable assistance was provided by clerical and stenographic staff of the University of Wisconsin.

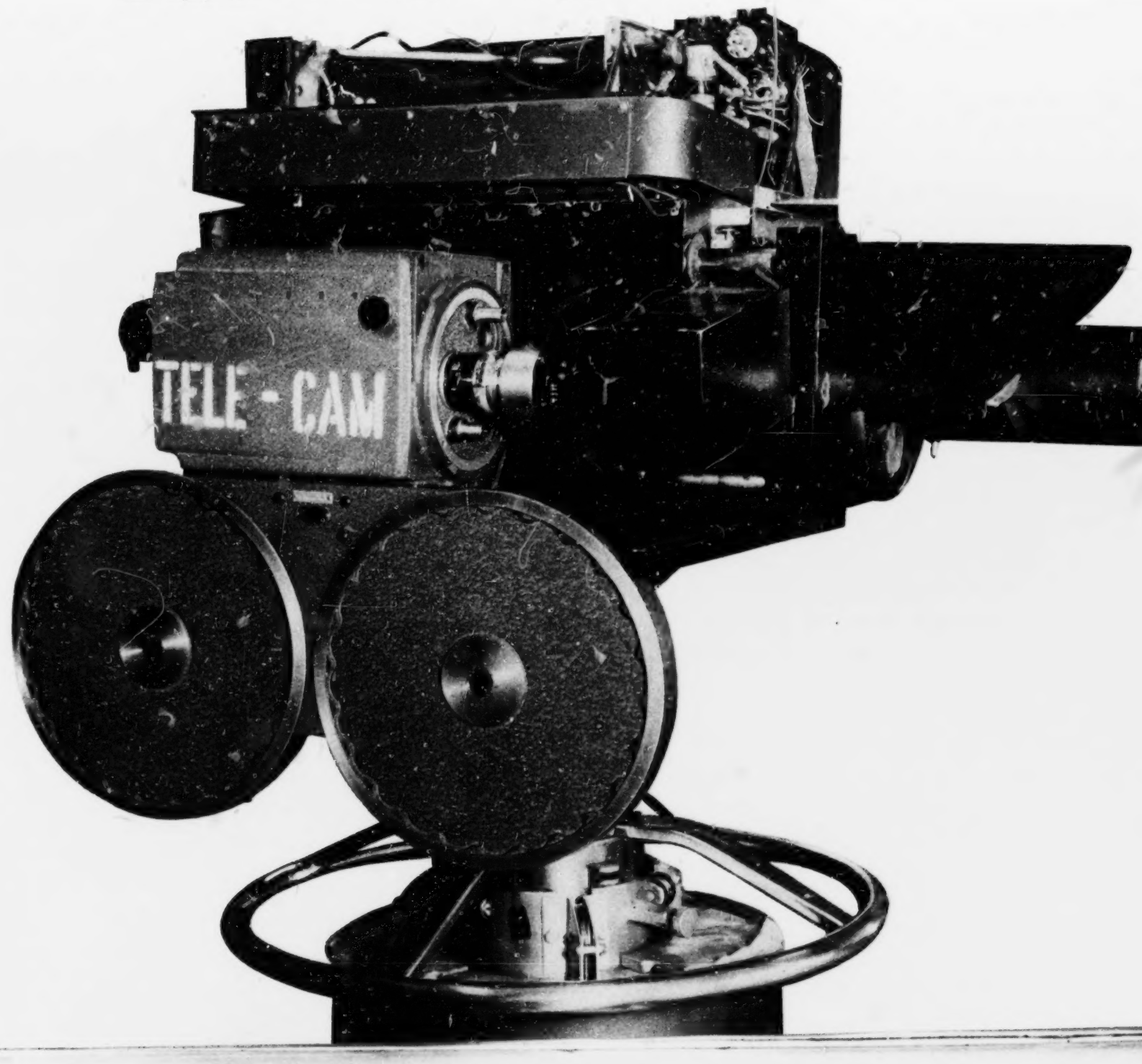
Finally, the local district principals and superintendents, and the high school teachers of physics, working together with close to 3,000 students, carried forward research plans and procedures in the 174 local high school districts which participated.

The project committee wishes to express its sincere thanks to all those listed above for their participation in the completion of this work.

THE PROJECT COMMITTEE
Milton O. Pella
Julian Stanley
C. A. Wedemeyer
W. A. Wittich,
Chairman



The equipment used in recording the White Physics T-films.



Part I Classroom Phase

More than a year before the first satellite was launched, the National Academy of Science announced its interest in the improvement of the teaching of science in American schools by appointing a committee to study this possibility. This Committee on the Improvement of Science Teaching in American High Schools recommended the securing of a skilled physics teacher to develop and teach a high school physics course via television. Dr. Harvey White, of the University of California at Berkeley, was enlisted as the person to accomplish this challenging assignment.

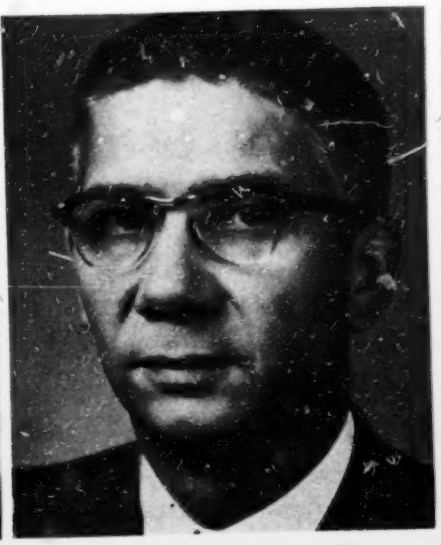
Following a period of intensive preparation, Dr. White began to teach the first one-year television course in high school physics in September, 1956. As he offered this series of 162 daily lessons, Dr. White was freed of all responsibilities save the planning of each day's lesson and collecting or actually creating the best physics laboratory equipment and demonstrations which he could conceive. The actual daily 30-minute telecasts were made over educational television station, WQED, in Pittsburgh. Twenty-six area high school physics classes were the receiving groups.

During the telecasts Encyclopaedia Britannica Films personnel were on hand to photograph, with 16-mm. sound film, the teaching which Dr. White accomplished. This photography was done with a motion-picture camera arrangement which actually split the light entering the television camera, and shunted a part of this light into a motion-picture camera which was physically attached to one side of the television camera. Since more than one motion-picture camera was used, a degree of post-program editing was possible. At the close of each day's television teaching, a complete 16-mm. sound motion-picture record of the 30-minute lesson was available. The result was the extremely rapid production of a 30-minute television film.

These television films can be described as a hybrid. They were made under rigid 30-minute television format conditions and therefore included many of the repetitions or inobtrusive errors or sometimes lengthy explanations which are characteristic of television per se. However, post-filming judgment could make limited improvement in quality through later editing. Thus, the two media—television and the sound motion-picture film—were brought into interplay. The resulting film record can be realistically described as more than television but less than the typical 16-mm. sound teaching film which often takes as long as two years to produce. The products of Dr. White's television teaching may be referred to as tele-films or, as they will be referred to in this study, T-films.

THIS IS THE RESEARCH PROJECT COMMITTEE

C. A. Wedemeyer



M. O. Pella

J. C. Stanley

W. A. Wittich

Following the viewing of the first T-films, planning was initiated at the University of Wisconsin to evaluate the effectiveness of the Harvey White materials as they might be used in on-going, representative, high school physics study situations. Because the study of physics in Wisconsin is undertaken by typical classroom and locally supervised correspondence techniques, two evaluations were necessary. These were: (1) the effectiveness of the T-films in typical classroom situations; (2) the effectiveness of the T-films in locally supervised correspondence study situations.

Since the correspondence study phase of the experiment has not been completed, this report is concerned only with the typical classroom phase. The correspondence study phase will be reported at a later date.

The Wisconsin Physics Film Evaluation Project Research Committee was created. The basic pattern of the evaluation study was drawn up and presented for review, to the Wisconsin State Department of Public Instruction; the Wisconsin Board of State College Regents; the School of Education, University of Wisconsin; and the Extension Division, University of Wisconsin. All approved.

The proposal was submitted to the Fund for the Advancement of Education and a grant for its support secured. The study materials were then created, the participating schools were contacted, the project staff was recruited, and the six sets of T-films were secured. The study was projected over two school years, 1957–1959, and involved the participation of sufficient numbers of Wisconsin high school groups to permit random statistical procedures.

In September, 1957, 83 schools began their participation as T-film-using and control groups during the 90-day, Semester I, 1957–1958, experimental period. All school groups, T-film-using as well as control, proceeded to study units on Mechanics, Properties of Matter, and Heat during this 90-day semester.

Before, during, and after the completion of the 90-day semester, a study of possible changes which occurred in the attitudes of teachers and pupils toward the use of the one T-film per day instruction idea was undertaken.

PROBLEMS TO BE INVESTIGATED

1. To determine the effect of the Harvey White physics T-films on the high school student's knowledge of physics as measured by subject-matter tests of physics.

2. To determine the effect of the Harvey White physics T-films on the high school teacher's knowledge of physics as measured by subject-matter tests of physics.

3. To determine the opinions of T-film-using students and teachers toward the using of a T-film per day as a part of regularly scheduled physics class instruction, and to compare the expressed interest in science of the experimental group with the control group.

PROCEDURE

All Wisconsin high schools in cities and towns under 100,000 population received a description of the proposed project and a written invitation to participate.

Replies were received from 226 schools which were subsequently visited personally by members of the project staff. During these visits, the nature of the project and the role of the participating schools were discussed. Schools wishing to participate agreed to do so regardless of whether later random selection would indicate that they participate as T-film-using or as non-T-film-using groups. Out of the group of 226 schools, 83 agreed to participate under such conditions. These 83 schools were placed in a 3 x 2 statistical grid established by three levels of teacher preparation and two levels of student intelligence. From this grid, 30 experimental and 30 control schools were selected by random means. This selection was made prior to the first day of classroom instruction.

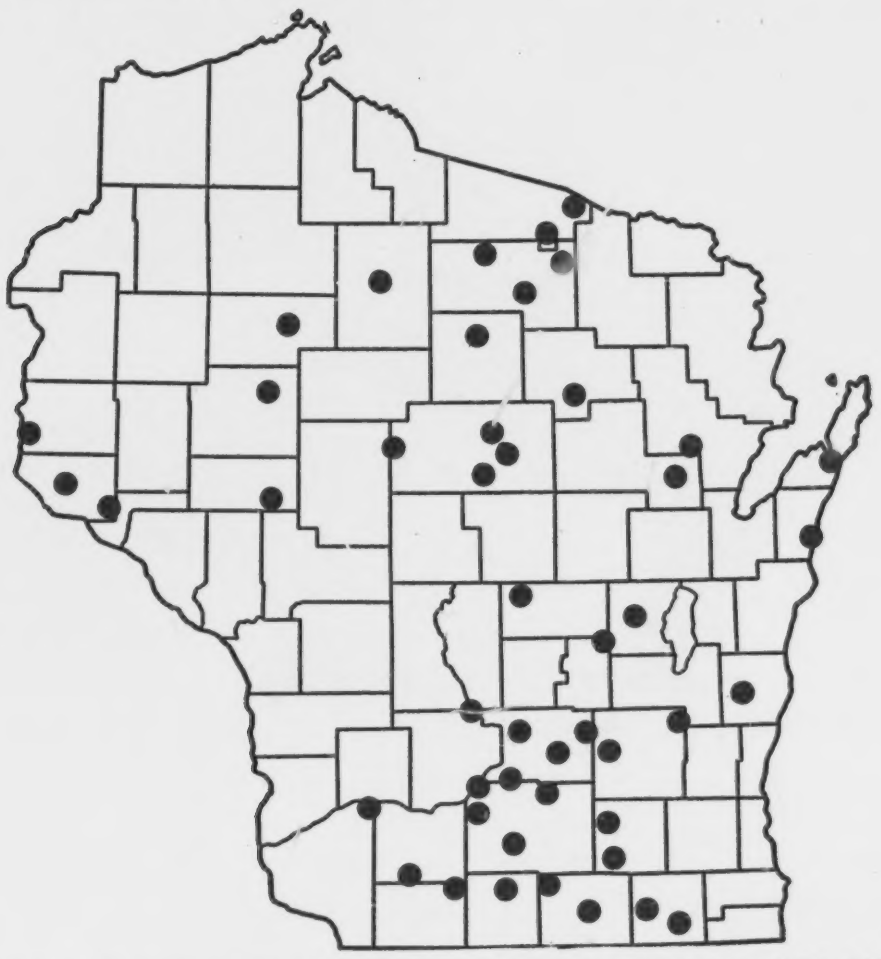
During the fall semester of 1957, each school using the T-films was scheduled to view one 30-minute Harvey White T-film per day and to use the lesson outlines that were provided. Any remaining class time was to be utilized by the teacher as desired. Control schools did not use the Harvey White T-films, however; they taught as usual and employed any other devices they desired.

At the end of the 90-day experimental period, in January, 1958, a third group of schools, known as the Control–Control (CC), was invited to join the experiment. Teachers and pupils of these CC schools did not see the films and were in no way previously associated with the project. The schools were selected on the basis of similarity to the control and experimental schools as to teacher credits in physics and student Henmon–Nelson scores. The purpose was to measure any possible "Hawthorne effect" (increased enthusiasm and effort due to a group's knowing that it is participating in an experimental situation).

DEVELOPMENT OF MATERIALS

Arrangements were made with the Wisconsin Board of State College Regents and the Wisconsin State College presidents so that members of the several state college physics departments were invited to participate in the production of original study and testing materials necessary to the conduct of the evaluation project. Interested members of the state college physics departments came together at planning and work meetings held at Madison, Wisconsin. At these meetings the general plan of the evaluation project was further developed, some of the Harvey White physics films were previewed, and the format for study materials was developed. Care was exercised to insure that these lesson outlines were of a non-teaching type; i.e., nothing was included which would interfere with the role of the experimental film materials.

36 SCHOOLS PARTICIPATED AS EXPERIMENTAL FILM-USING CENTERS



47 SCHOOLS PARTICIPATED AS CONTROL SCHOOLS AND USED NONE OF THE WHITE FILMS

THIS IS THE 1957–1958 GRADUATE STUDENT RESEARCH STAFF

C. Eben L. Garside J. Price D. Scott J. Busch

At these meetings, procedures for previewing the remaining films and the nomination of multiple-choice Wisconsin Physics Test items were agreed upon. The state college physics staff members worked as teams to complete the previewing of groups of the Harvey White T-films, to complete the teacher and pupil study guides, and to recommend multiple-choice test items as they worked during the remainder of the spring semester and summer.

Unit, mid-semester, and end-of-semester Wisconsin Physics Tests were constructed. Each Wisconsin Test included items of two kinds: (1) items which measure content found in the T-films as well as in the texts used by participating schools; and (2) items which measure content found only in the Harvey White T-films. Both kinds of test items were included in the unit tests. Only (1)-type items were included in the semester and Wisconsin Final Physics Test.

The project committee evaluated known physics tests and finally selected three additional tests to be used along with the Wisconsin Physics Tests. These tests were:

1. The Ohio Physics Scholarship Test
2. The Chicago Physics Tests (as used in the Chicago evaluation of the Harvey White T-films)
3. The College Cooperative Physics Test (administered to participating teachers)

The Wisconsin Tests were administered to each T-film and control group when they completed each unit. Standardized physics tests were administered to the T-film and control groups at the beginning and end of the 90-day (Semester I) period and at the end of the academic year. The Wisconsin Final Physics Test was administered to the Control–Control group at the end of Semester I to measure possible "Hawthorne effect."

In May, 1957, and again in May, 1958, all of the teachers who participated in the experiment were asked to report to their nearest Wisconsin State College or to the University of Wisconsin for the purpose of taking a 3-hour and 40-minute college-level physics test. This was done by all the teachers.

All tests were machine-scored and the scores subjected to exhaustive statistical analysis which is reported in the several tables which follow.

QUESTION:

How did the ability of the T-film-using groups and control groups compare?

ANSWER:

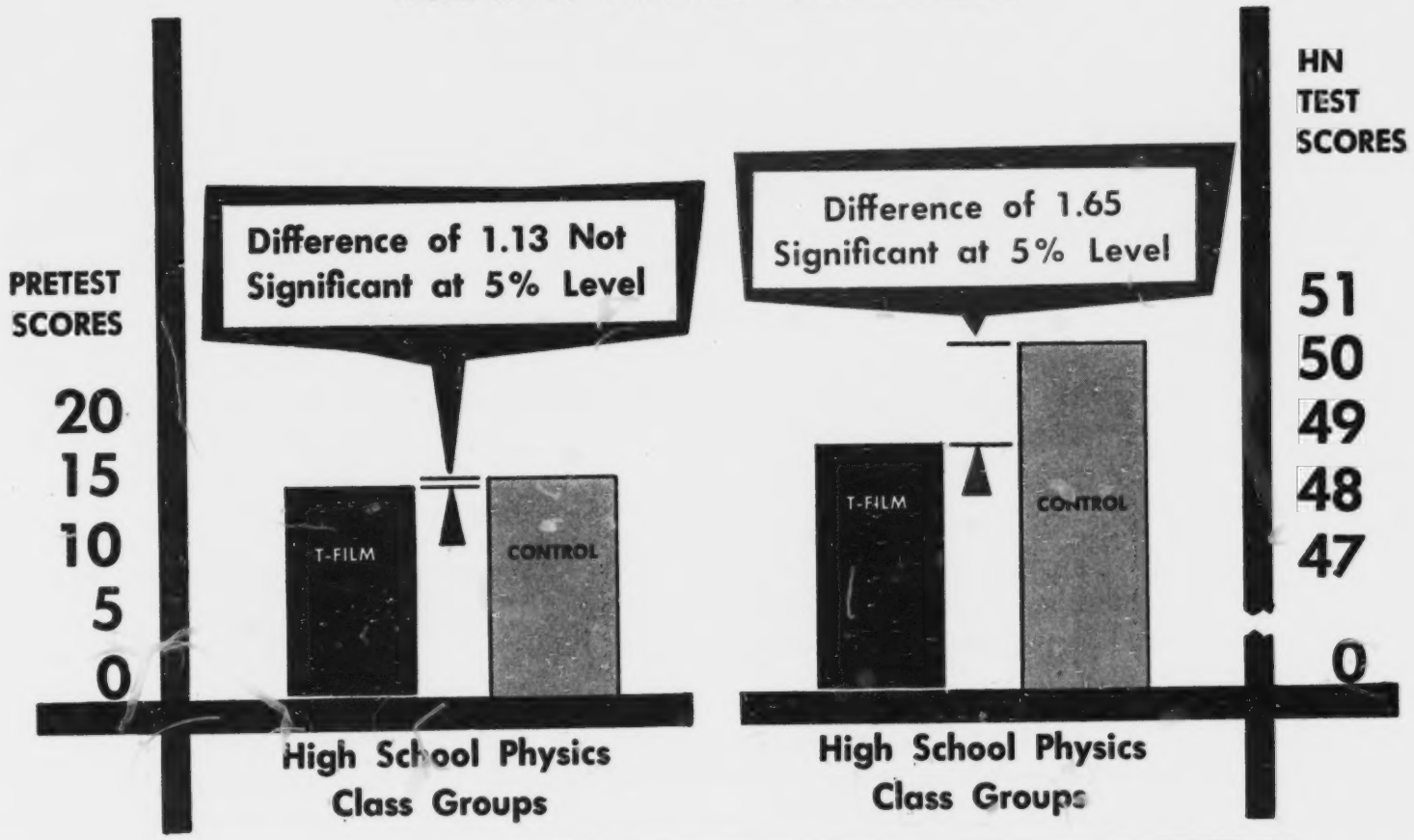
In the fall of Semester I, 1957–1958, all participating students were asked to take a pretest. This pretest was the April, 1957 form of the Ohio Scholarship Every Pupil Physics Test. It included 80 items. As can be seen in Figure 1, there was a raw score difference between the mean accomplishment of the two groups of 1.13 in favor of the control group. When this difference was subjected to a test of significance, it was found not to be statistically significant, although it approached significance.

In determining the approximate intelligence levels of the experimental and control groups, Henmon-Nelson Test scores were used. In Wisconsin, the Henmon-Nelson Test is administered to almost all high school students enrolled in the public schools during their freshman and again during their junior year. Since most participating students were seniors, the lag between testing and reporting of scores made it desirable to use freshman raw scores. All scores were secured from the central state testing office which made possible a high degree of accuracy.

As can be seen in Figure 1, the Henmon-Nelson raw score mean for the 30 control schools was 1.65 higher than for the T-film schools. **This 1.65 differential in favor of the control schools was found to be significant at the 5 per cent level, and therefore becomes a factor to be corrected for when comparing the physics accomplishment test scores earned by the two groups.** This differential occurred even though schools were randomly selected.

FIGURE 1

Pretest and Henmon–Nelson (Intelligence) Scores of 30 T-film-Using and 30 Control Groups of High School Students at Work in 60 Wisconsin School Districts



	Pretest	Henmon-Nelson	Total No. of Students
30 T-film Schools	M* = 15.06	M = 49.01	550
30 Control Schools	M = 16.19	M = 50.66	782
Raw Score Test Differences	1.13 (In favor of control group)	1.65 (In favor of control group)	
Significance of the Test Differences	F = 3.65 (Not statistically significant)	F = 5.26 (Significant at .05 level)	
Significance Values for .05 Level	$F_{1,48}(.05) \geq 4.04$		

*M = Mean

QUESTION:

How did the use of a 30-minute film per day as measured by the Wisconsin Final Physics Test influence the learning of students enrolled in high school physics classes?

ANSWER 1:

The control and T-film-using groups showed no significant difference in the amount of physics learned, that was presented in both T-films and textbooks.

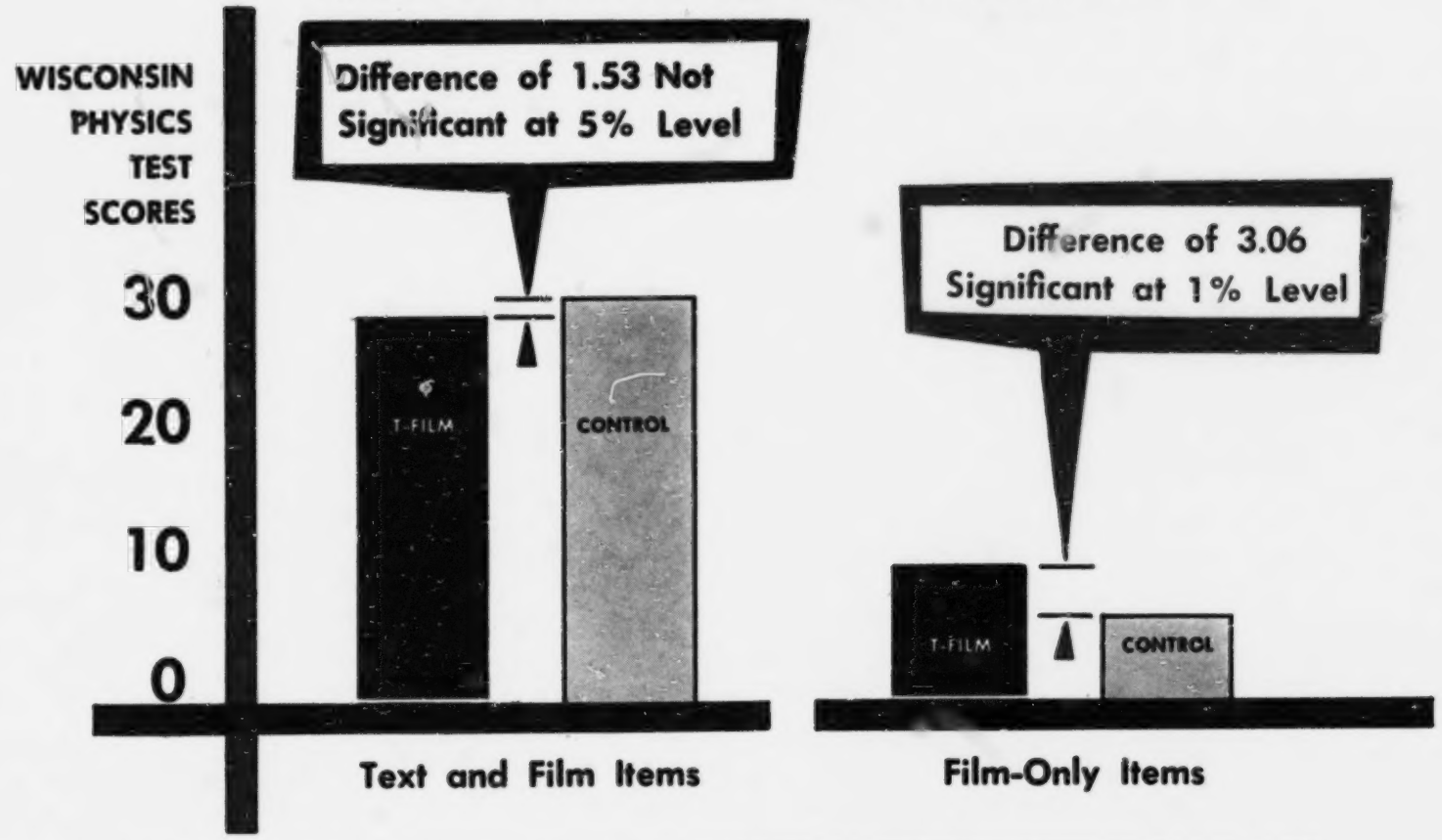
ANSWER 2:

The T-film-using group showed a significant level of achievement above that accomplished by control groups in the case of the physics information included in the Harvey White T-films only.

The semester-end test on physics information found in both text and in T-films contained sixty-five items. Twenty-five test items which measured information which was found **only in the T-films** were included in **unit** tests on Mechanics, Heat, and Properties of Matter which were administered during Semester I, 1957–1958. No "film-only" test items were included in the **semester-end** test.

FIGURE 2

Wisconsin Physics Test Scores Earned at End and During Semester I, 1957–1958 by 30 T-film and 30 Control Groups of High School Students in 60 Wisconsin School Districts



	Semester Test on Information in Both Text and Films	Unit Test Items on T-Film Information Not in Texts
	Score*	Score*
30 T-Film Groups: Adjusted Mean*	29.19	9.58
30 Control Groups: Adjusted Mean*	30.72	6.52
Differences in Means	1.53	3.06
Significance of the Differences in the Means	F = 1.33 (Not significant)	F = 99.71 (Significant in favor of T-film-using groups beyond 1% level)
Significance Values at 5% Level and 1% Level	$F_{1,48}(.05) \geq 4.04$ $F_{1,48}(.01) \geq 7.19$	

*These scores were adjusted for the significant difference in Henmon-Nelson (intelligence) mean scores, which existed between T-film and control groups, in favor of control groups.

QUESTION:

How did the use of a 30-minute film per day as measured by the January Ohio Test influence the learning of students enrolled in high school physics classes?

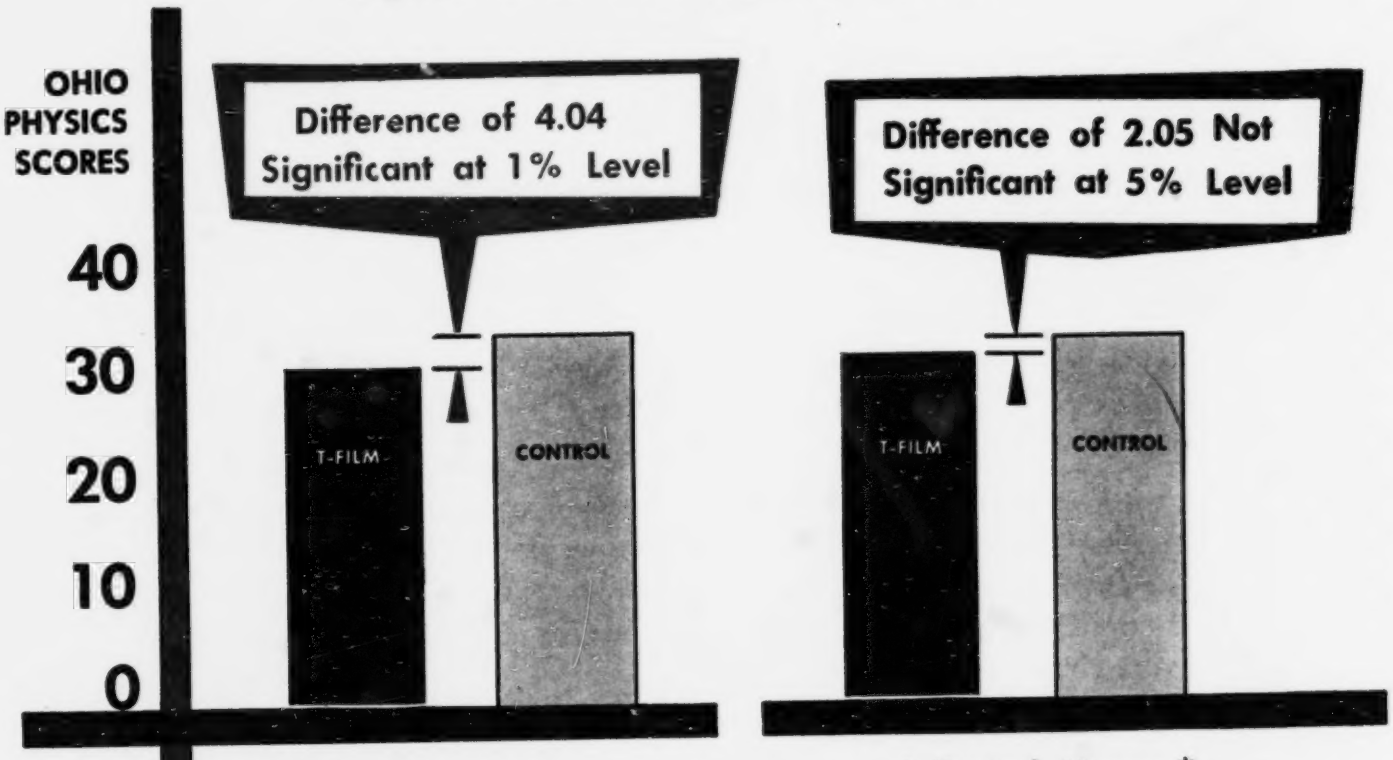
ANSWER:

The analysis of variance on the January Ohio Test scores showed a difference in the amount of physics learned between the T-film and control groups. This difference was statistically significant at the 1 per cent level in favor of the control groups.

When the differential in intelligence, which existed in favor of the control groups, was corrected for by analysis of covariance it was revealed that no significant difference in achievement existed between the treatment groups. This finding was in agreement with findings reported on the Wisconsin Final Physics Test in Figure 2.

FIGURE 3

Ohio Physics Test Scores Earned at the End of Semester 1, 1957–1958 by 30 T-film and 30 Control Groups of High School Students in 60 Wisconsin School Districts



	Unadjusted Means: Analysis of Variance	Adjusted Means:* Analysis of Covariance
30 T-Film Groups	30.84	31.83
30 Control Groups	34.88	33.88
Differences in Means	4.04	2.05
Significance of the Differences in Means	F = 9.74 (Sig. at 1% level)	F = 4.02 (Not Significant)
Significance Values at 5% Level and 1% Level	$F_{1,48}(.05) \leq 4.04$ $F_{1,48}(.01) \leq 7.19$	

*These scores were adjusted for the significant differences in Henmon-Nelson (intelligence) mean scores, which existed between T-film and control groups, in favor of control groups.

QUESTION:

How did the T-film-using groups compare with the control groups in terms of retention of physics information?

ANSWER:

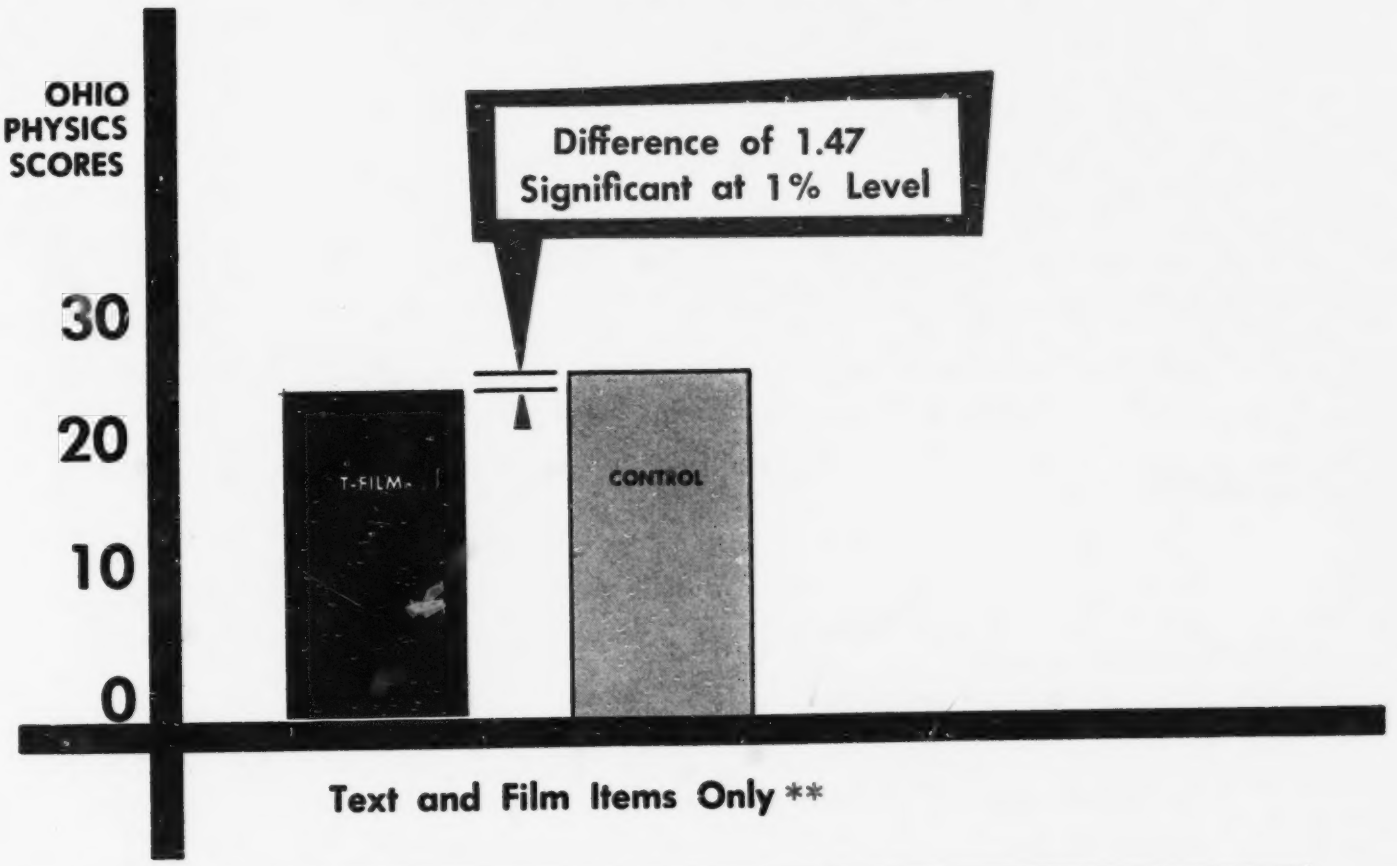
The control groups retained more Semester I physics information than the T-film-using groups after a period of three months (exclusive of film-only information).**

To measure retention of information learned during the experiment, it was necessary to equate the T-film and control groups on the amount of the end-of-semester physics information, since a significant difference existed on both the final Ohio and the final Wisconsin Tests before the scores were adjusted for the Henmon-Nelson differential.

Because multiple forms of the Ohio Test existed, and since the 1957 form of this test was utilized as one measurement of final physics achievement, it was the logical form to employ as a means of equating the groups. In this way, it was possible to determine which of the groups really retained more information. The adjusted scores were 24.58 and 26.05 respectively for the T-film and control groups. This difference was tested for significance and found to be significant at the 1 per cent level in favor of the control groups.

FIGURE 4

Comparison of the T-film and Control Groups With Reference to the Three-Month Retention of Physics Information as Measured by Ohio Physics Test



	Retention Test
	Score
30 T-film Groups: Adjusted Mean*	24.58**
30 Control Groups: Adjusted Mean	26.05**
Difference Between the Means	1.47
Significance of the Test Difference	F = 8.23 (Significant beyond 1% level)
Significance Value at 1% Level	F1,47 (.01) ≤ 7.20

*These scores were adjusted for the significant difference in the January Ohio Test mean scores, which existed between T-film and control groups, in favor of control groups. (See unadjusted mean scores, Figure 3.)

**In interpreting the above, it must be noted that the Ohio Tests included only those items which appeared both in T-films and textbooks. No film-alone test items were included in these Ohio standardized tests.

QUESTION:

Did the three groups—control, T-film, and control-control—differ in achievement as measured by the Wisconsin Physics Test, Semester I, 1957–1958?

ANSWER:

The C groups out-performed both T-film and CC groups by 2.5 and 2.05 respectively. These differences were significant at the .05 level when tested by analysis of covariance.

POSSIBLE INTERPRETATIONS:

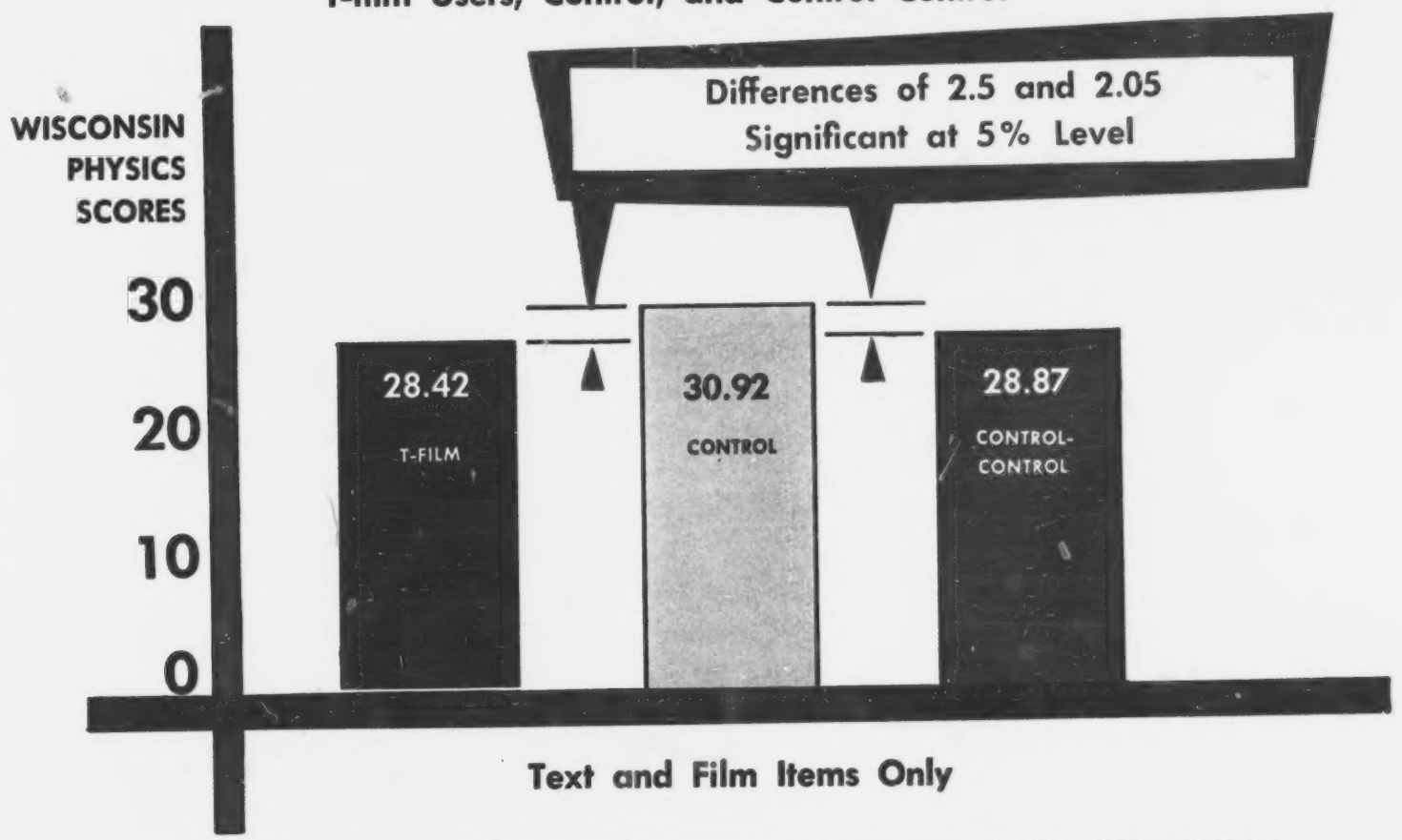
In Figure 2, the control group exceeded the T-film group by 1.53 points. **This difference was not significant** when tested by covariance procedures with Henmon-Nelson scores as the only covariate.

When the CC groups were added, the fifty-two additional cases introduced a degree of precision which resulted in a significant difference between the control group and T-film—CC groups.

Because the CC groups neither saw the films nor knew that they were in the experiment (until five days before taking the semester-end test), it might be assumed that the superior performance of the control groups was the result of the "Hawthorne effect" (increased enthusiasm and effort due to a group's knowing they are the control group in an experimental situation).

FIGURE 5

Wisconsin Physics Tests Scores* Earned at End of Semester I, 1957–1958, by Three Groups of High School Physics Students: T-film Users, Control, and Control–Control**



Student Groups:	30 Control Groups	30 T-film Groups	52 Control-Control Groups***
Adjusted* Wisconsin Physics Test Scores, End of Semester I, 1957-1958	30.92	28.42	28.87

*Scores were adjusted for differences in student Henmon-Nelson intelligence and differences in teacher-earned college physics credits.

**The Control-Control groups were given their initial invitation to participate in this experiment in late January, 1958 (end of Semester I, 1957-1958). These schools were invited to take the semester-end Wisconsin Physics Test. The groups were selected on the basis of the degree to which students paralleled T-film and control groups on student Henmon-Nelson raw score means and teachers on physics credits earned. (Slight differences were equated and removed by analysis of covariance.)

***60 schools were sought; only 52 could be located where Henmon-Nelson scores and teacher credits were similar to 30 T-film plus 30 control schools.

QUESTION:

Were the differences in college-level physics credits earned by the 60 teachers who taught the T-film and control groups of high school students reflected in the physics test score earned by the students at the end of Semester I, 1957–1958?

ANSWER:

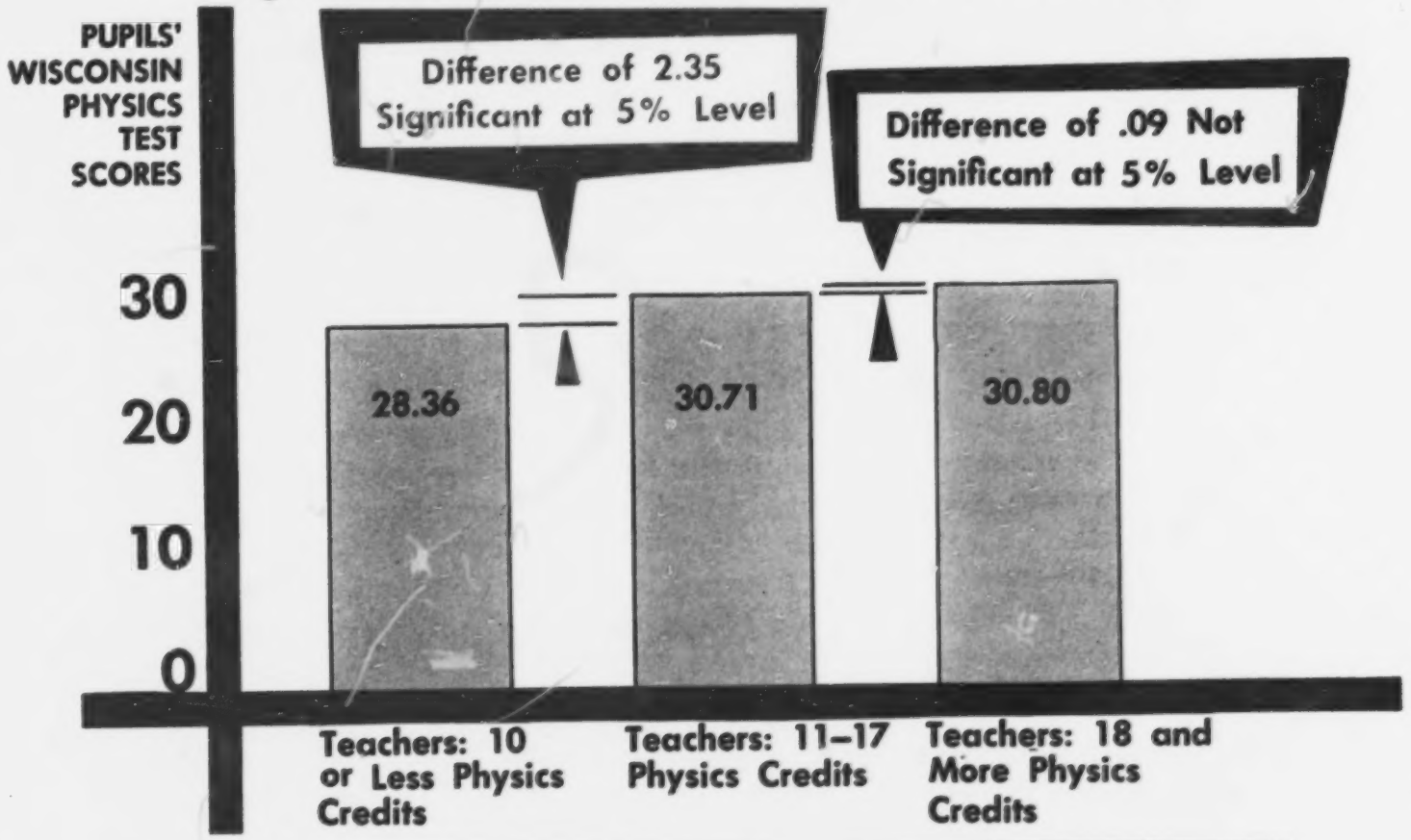
Yes and no. The accomplishment of those students who were taught by teachers in the 10 and less college physics credits groups is significantly lower than the accomplishment of students taught by teachers who earned 11 to 17 credits or 18 and more credits in college-level physics. This difference is significant at the .05 level.

There is no significant difference, however, between the level of accomplishment of students taught by teachers in the 11 to 17 credits groups and 18 and more credits group.

In short, differences in the physics training of the participating teachers are reflected in the achievement of the students up to the point of 18 credits in college-level physics. Above that point, this study shows no significant change in the achievement of students.

FIGURE 6

The Relationship of College-level Academic Physics Credits Earned by 60 Teachers Participating as T-film and Control Group Teachers, and Student Accomplishment as Measured by the Wisconsin High School Physics Test at End of Semester I, 1957–1958



Teacher Groups by College Physics Credits Earned as of September, 1957	Mean Adjusted Test Scores for All 60 High School Physics Classes (Pooled T-film and Control Groups)	Significance of Difference Between Groups
18 and More Earned College-level Credits in Physics	30.80	Difference is not significant
11 to 17 Earned College-level Credits in Physics	30.71	Difference is significant at 5% level
10 and Less Earned College-level Credits in Physics	28.36	F = 4.44
Significance Value at 5% Level	F (.05) ≤ 3.19	

QUESTION:

What influence did the use of a 30-minute Harvey White physics T-film per day have on the teacher's knowledge of physics?

ANSWER:

The teachers who saw the films learned a significant amount of physics information above that learned by control teachers.

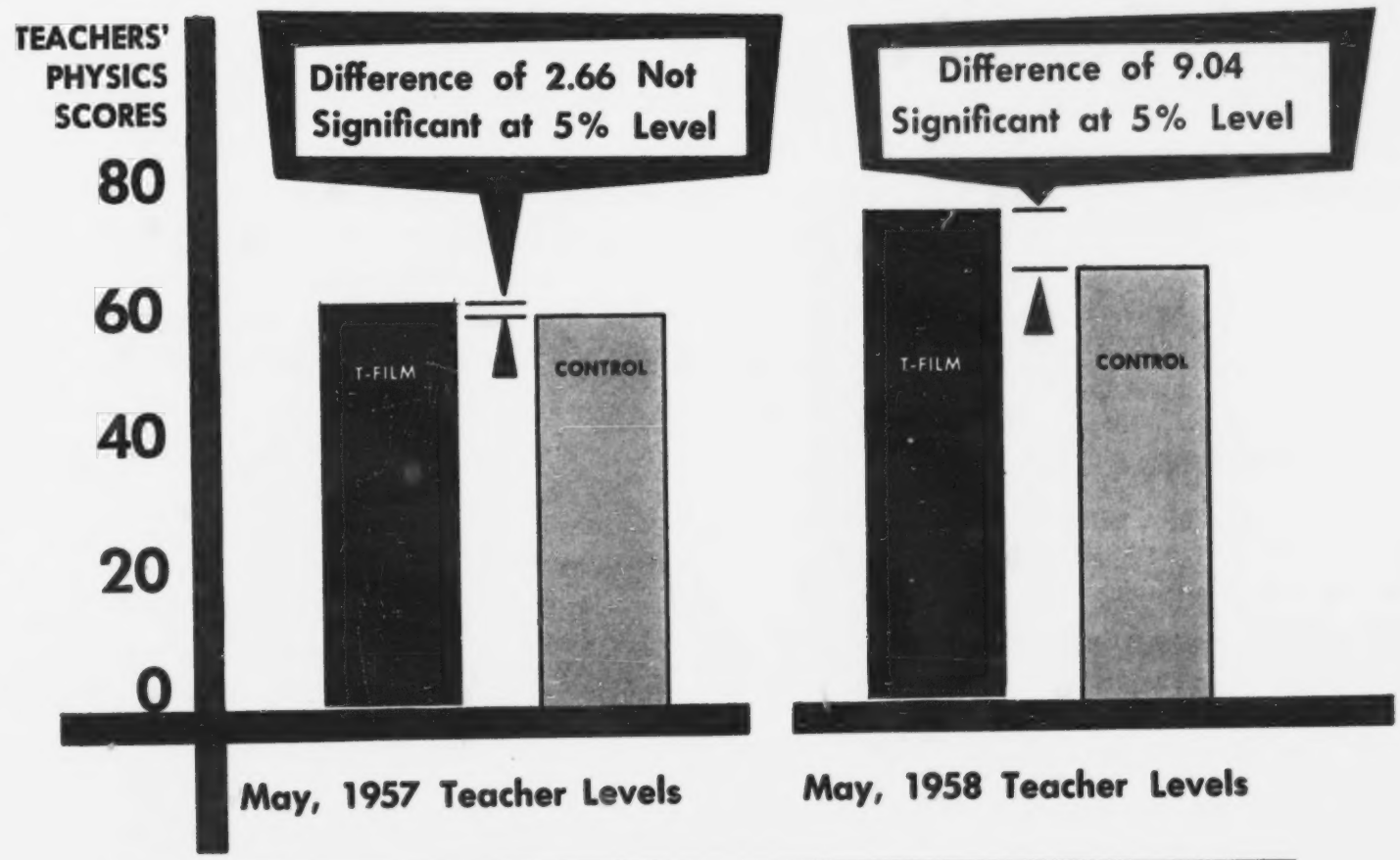
The Cooperative Physics Test, Educational Testing Service, was used to measure teacher knowledge of physics. In May, 1957, the participating teachers of both T-film-using and control groups were asked to report to the chairman of the Department of Physics at the nearest Wisconsin State College or to the University of Wisconsin Department of Education for the purpose of taking the 3-hour and 40-minute physics test. As can be seen in Figure 7, a 2.66 raw score difference in favor of T-film teachers was recorded at that time.

In May, 1958, three months after the close of the experimental semester, these same teachers were asked to repeat the test. In Figure 7 it may be observed that a 9.04 difference occurred in May, 1958, in favor of the T-film teachers. Using the test for significance, this difference is found to be significant at the 5 per cent level.

The Cooperative Physics test is a test of college-level physics. It can be assumed that the difference in the means and the gains by the T-film teachers may be attributed to their seeing the eighty-one Harvey White T-films on Mechanics, Properties of Matter, and Heat.

FIGURE 7

Cooperative College Physics Test Scores Earned by 30 T-film Teachers and 30 Control Teachers in 60 Wisconsin High School Districts on Tests Given in May, 1957 and May, 1958



	May, 1957			May, 1958		
	Range	Mean	S.D.	Range	Mean	S.D.
30 T-film Teachers	8–141	62.73	35.15	30–145	76.17	35.53
30 Control Teachers	12–122	60.07	28.53	16–133	67.13	30.18
Raw Score Test Differences	2.66 (In favor of T-film teachers)			9.04 (In favor of T-film teachers)		
Significance of the Test Differences	T<1 (Not significant)			T=2.59 (Significant at .05 level in favor of T-film teachers)		
Significance Values at .05 Level	T(.05) ≤2.01					

QUESTION:

Were the differences in college-level physics credits earned by the 60 teachers who taught the T-film and control high school physics classes reflected in teacher-earned scores on the Cooperative College Physics Test administered in May, 1957, and May, 1958? (Before and after the one-semester use of the Harvey White Physics T-films.)

ANSWER:

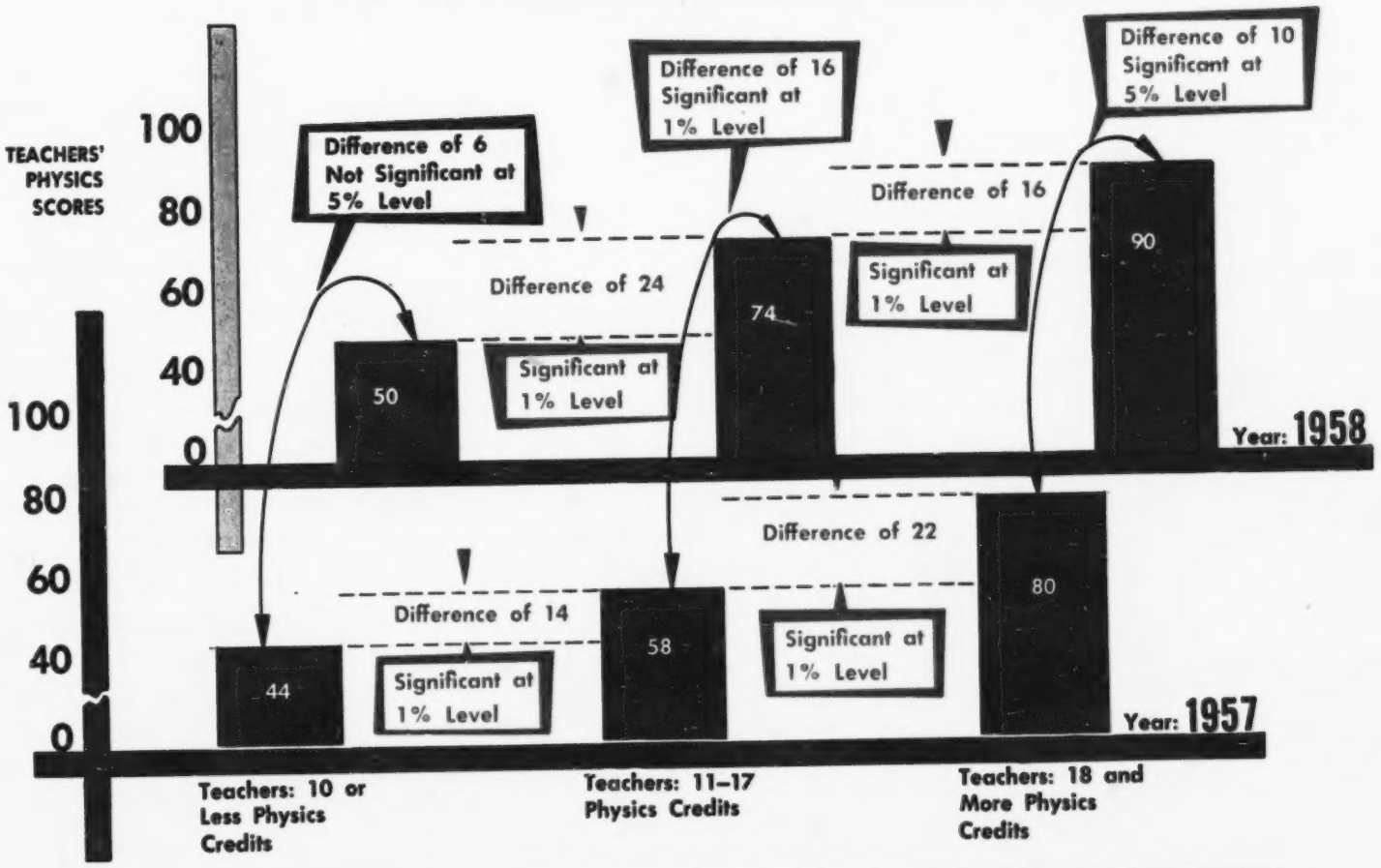
Yes, differences in college-level physics credits earned by the 60 teachers of T-film and control groups were directly reflected in Cooperative College Physics Test scores earned. The more credits a teacher possessed, the higher were the physics test scores he earned. In every case this circumstance was supported by differences which were statistically significant at either the 1 per cent or 5 per cent level.

Also significant was the fact that the 60 teachers as a group reflected improvement in knowledge of college-level physics after one semester of participating in the experimental study either as a T-film teacher or as a control group teacher. The T-film teachers showed most change. (See Figure 7.)

It should be noted that the teachers with average and above average preparation in physics gained a significant amount of knowledge of physics in the period between the 1957 and 1958 tests.

FIGURE 8

The Relationship of College-level Academic Physics Credits Earned by 60 Teachers Participating as T-film and Control Group Teachers and Teacher Accomplishment as Measured by the Cooperative College Physics Test



Teacher Groups by College Physics Credits Earned as of September, 1957	May, 1957 Cooperative Physics Test Score	Significance Level	May, 1958 Cooperative Physics Test Score	Significance Level	1957 vs 1958
18 and More Earned College-level Credits in Physics	M =80.60 σ =32.14	T =5.99 (Sig. at 1% level)	M =90.10 σ =30.72	T =4.10 Sig. at 1% level)	T =2.50 (Significant at 5% level)
11 to 17 Earned College-level Credits in Physics	M =58.75 σ =25.82	T =3.97 (Sig. at 1% level)	M =74.85 σ =30.24	T =6.96 (Sig. at 1% level)	T =4.48 (Significant at 1% level)
10 and Less Earned College-level Credits in Physics	M =44.85 σ =27.64		M =50.00 σ =25.36		T =1.48 (Not significant)
T (.01) ≤2.67 T (.05) ≤2.01					

Exhibit 1

OPINIONS OF THE TEACHERS

QUESTION: What were the opinions of the physics teachers in the experimental schools toward the Harvey White T-films?

ANSWER:

1. The T-films offered excellent laboratoy demonstrations and experiments not possible in the ordinary high school laboratory. Forty-seven per cent of the teachers rated the demonstrations and experiments "superior" and the remaining 53 per cent rated them "excellent."
2. The majority of the teachers using the T-films felt that the organization of the content in the films was excellent.
3. The T-films helped to keep the teacher and the students on the topic of physics at a continuous pace.
4. There was agreement among the T-film-using teachers that the T-film consumed too much of the currently scheduled class time. They felt that to use the T-films adequately would necessitate lengthening class periods to 70 minutes per day. An alternative suggestion was to limit the number of films to three or four per week.
5. Teachers who held either strong positive or negative reactions to T-films at the beginning of the experimental semester strengthened such reactions as the semester progressed.
6. Teachers with above-average preparation in physics tended to reject the T-films as an instructional material. Teachers with less than average preparation in physics typically accepted the T-films as a means of improving the teaching of high school physics.
7. Many teachers disapproved of giving up practically complete class time to "another teacher": the T-film teacher. This feeling strengthened as the semester progressed.
8. Teachers reported that they had learned many helpful teaching suggestions as the result of using the T-films.
9. Fifty per cent of the T-film-using teachers said they would use them again with some modifications to the rigidly controlled circumstances which, of necessity, were imposed during the Wisconsin Physics Film Evaluation Project.
10. Teachers felt that a film a day did not provide enough variety or flexibility in the high school physics course.

Exhibit 2

OPINIONS OF THE STUDENTS

QUESTION: What were the opinions of the physics students in the experimental schools toward the Harvey White T-films?

ANSWER:

1. The opinions of the students in the experimental schools using the Harvey White T-films reflected or at least coincided with the opinions of their teachers. The correlation between the students' opinion scores and the teachers' opinion scores was .58.

2. Positive opinions most frequently expressed by students toward the T-films included:
   a. We could never have seen such excellent laboratory equipment or had so many excellent demonstrations without the T-films.
   b. The films keep the teacher and the students on the topic of physics.
   c. The experiments always work; no class time is lost on experimental failures.
   d. Dr. White makes excellent use of charts, diagrams, equipment, and experiments in explaining new concepts.
   e. Taking notes from the films is good experience.
   f. Dr. White does an excellent job in explaining the development of formulas.

3. Negative opinions most frequently expressed by the students toward the T-films included:
   a. The pace is too fast in the films.
   b. It is impossible to take notes and watch the films.
   c. The laboratory films are too long and drawn out and boring.
   d. There is no chance to ask questions while the film is being shown, and the problem is forgotten when the film has been completed.
   e. The mathematics is too involved and advanced.
   f. The films leave no time either to practice what we learn or do our own experimental work.

4. When the students were polled in January, after completion of the experiment, 51 per cent said they liked viewing the Harvey White T-films. Three months later, only 30 per cent of the students said they liked viewing the T-films.

5. The students preferred, by a 3-to-1 margin, the laboratory film lessons to the lecture film lessons.

6. A minority of the students felt that film instruction was more interesting and a greater incentive to learning than the usual classroom procedure.
7. The T-film-using students reported that they did less textbook reading, less writing-up of assignments, less outside-of-class studying, more note-taking, and more paying attention in class than did the students in the control schools.

Exhibit 3

STUDENTS' INTEREST IN SCIENCE

QUESTION: What influence did the Harvey White T-films have on the students' interest in science in comparison to the control students' interest in science?

ANSWER:

1. In October, half-way through the experiment, and in January, the end of the experiment, the control students expressed a higher interest in science than did the T-film students. In both cases the difference between the control and experimental groups was significant at the 1 per cent level.
2. The control students anticipated going to physics class more than did the T-film students. The difference was statistically significant at the 1 per cent level.
3. Intelligence had a positive influence on students' interest in science. The higher the intelligence, the more interest in science the students expressed.
4. Teachers with below average preparation in physics seemed to do a better job of building student interest in science when using the T-films than when using traditional methods for teaching physics. The opposite was true for teachers with above average preparation in physics.

The locally supervised correspondence study phase of the evaluation of the Harvey White T-films is currently going forward in 12 Wisconsin high schools.

The classroom phase of the study is proceeding into its second year under the following circumstances:

A limited number of schools is currently using the T-film on each school day for 162 days. These schools are each using the film in a manner decided upon by the local teacher. In most cases the films are being used outside of class but under controlled conditions. The regular class period is used for discussion, problem-solving, and individualized instruction. Case studies will report procedures; testing techniques similar to those employed in 1958 will reveal accomplishment.